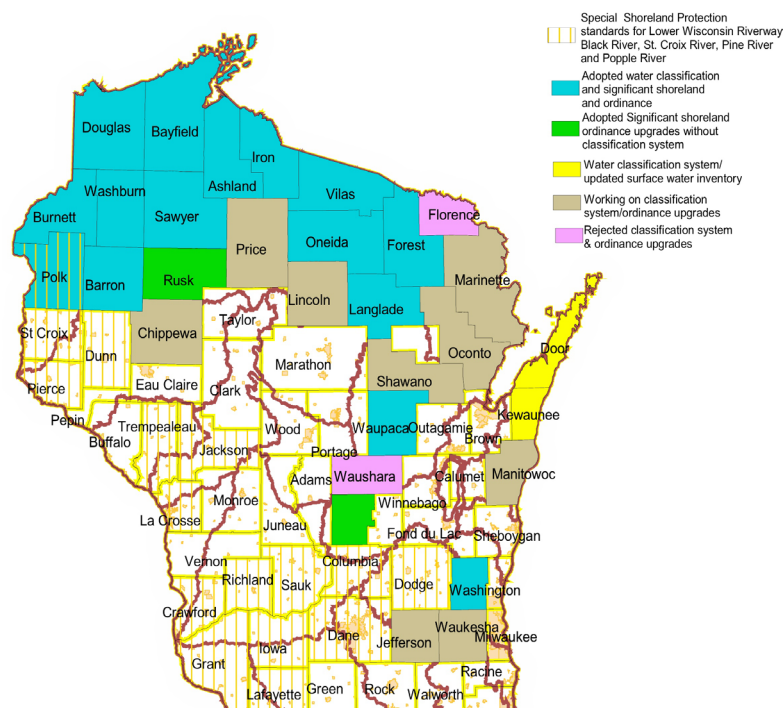


# Chapter 4: Inland Lakes

## Lake Planning and Management

Figure 25. Lake Classification Program, 2002



All of Wisconsin's 15,057 inland lakes are considered significant public resources. The great variety of lake types makes management a challenge. Lakes range in depth from a few feet to 236 feet (Big Green, Green Lake County), from small ponds to 137,708 acres (Lake Winnebago, Winnebago County), and from clear soft water lakes to hard water lakes prone to intensive algal growth.

Wisconsin's Lake Management Program combines monitoring and water quality assessment, research, and community financial, organizational, educational and technical assistance. The purpose is to plan, protect and restore the state's lakes and their ecosystems in partnership with other agencies and citizens. The Wisconsin Lakes Partnership is a team of WDNR, University of Wisconsin-Extension (UWEX) staff and citizens represented by the Wisconsin Association of Lakes, who bring technical expertise, outreach and stakeholder concerns together to focus on the state's lakes.

### Strategic Planning

In 2002, the Wisconsin lakes strategy, *The Water Way*, was completed and distributed. The *Water Way*, provides a map for the Partnership's work in the first decade of the 21<sup>st</sup> century. This plan was the result of years of work by people concerned about the future of Wisconsin lakes and includes visions, goals, strategies and performance measures. Different future scenarios are discussed and strategic work is outlined. All possible future avenues for lakes in Wisconsin are explored, including:

- "natural waters vision", which is possible under a protection strategy. This vision would include protecting water quality, habitat, aesthetics, and tranquility by maintaining low density development through the use of restrictive standards.
- "semi-developed waters vision", under a protection and restoration strategy. This vision involves protecting the remaining natural shoreline area and restoring the natural shoreline by establishing zoning standards for moderate density, single family and residential development; runoff controls, incentives; and motivational incentives.
- "developed waters vision", under a restoration strategy. This vision involves restoring the functional aspects of shoreline buffers to provide habitat, aesthetics and water quality. Protect from deteriorating growth of 2nd and 3rd tier development by establishing enforceable zoning ordinances.

While a variety of tools are used to encourage the types of protection and restoration work involved in all three scenarios, one of the most effective tools is the state's Lake Classification Program, which through the Lake Planning Grant Program, provides funding to local municipalities to develop protected areas around lakes through a local shoreland ordinance that may be more stringent than the state's required shoreland ordinances. The passage of these county local ordinances are based on outreach and discussion of the communities' desired future vision for their lakes. Today, the majority of counties in the state have some type of local level water inventory, classifica-

tion system, and about 20 percent have a local ordinance in place that is more protective of their lakes than the statewide model zoning ordinance. The DNR and local communities are working together to analyze how changes to NR115 may affect regulations already in place.

## Lake Organization and Education Assistance

A community of lake enthusiasts help manage the state's rich array of lake resources. While the WDNR has state authority to manage and regulate lakes, provide public assistance and conduct research, the UW-Extension (UWEX) - Stevens Point provides lake organization and education assistance statewide. Staff at UWEX develop, publish and distribute printed and electronic media, providing useful information to citizen members of Wisconsin's hundreds of lake management organizations on a wide array of issues ranging from water law to limnology. UWEX also publishes a quarterly newsletter, *Lake Tides*, which is distributed to 23,000 homes, businesses and nonprofits. *Lake Tides* and many other publications are also now offered on-line through the Wisconsin Lakes Partnership website.

<http://www.wisconsinlakes.org/>

In 2001, UWEX published a comprehensive guide *Wisconsin Water Law: A Guide to Water Rights and Regulations*. UWEX is also the location of the Partnership's youth education efforts, staffing and coordinating Project WET and Adopt-A-Lake programs.

To better prepare the next generation of citizens for positions in lake advocacy, the Wisconsin Lake Leaders Institute was established through UWEX. UWEX staff also attend and speak at numerous lake organization meetings, fairs and related events. Approximately 1200 people are reached annually through conferences and community meetings conducted by UWEX staff.

## Aquatic Plant Management

Nuisance aquatic plants can limit aesthetic and recreational enjoyment of lakes and replace beneficial native plants that provide food and cover for fish and other wildlife. Historically permits have been issued for chemical treatment only to alleviate severe problems in specific areas. Manual and mechanical harvesting has gone largely unregulated. Much of Wisconsin's aquatic plant management, and especially preventing and managing the spread of invasives, particularly Eurasian water milfoil, have relied primarily on educational efforts.

In 2001, the Wisconsin legislature passed Act 16 which provided a comprehensive approach to lake aquatic plant management. The law requires watercraft inspections, information and education, research initiatives, and purple loosestrife management and directs the DNR to implement a state-wide program. Authority in the law:

- Prohibits launching of watercraft with aquatic plants & zebra mussels;
- Regulates all the methods of aquatic plants management;
- Requires posting of public boat access sites;
- Designates Eurasian Water Milfoil (EWM), curly leaf pond weed and purple loosestrife as invasive plants. Additional plants can be added by rule.

A permit is now required for all methods of control including manual and mechanical removal as well as the introduction of nonnative aquatic plants. Plan approval for enacting most control methods is required by rule.

One key component of the aquatic plant management program is the identification of sensitive areas for protection that provide critical or unique fish and wildlife habitat, scenic beauty and other factors. The WDNR encourages a sensitive area survey as part of lake planning activities and recently compiled standardized methods for conducting these activities statewide.

The expansion of authority under the new rule did not, however, provide additional resources such as funding or staff to implement the program. DNR is working through the issues associated with greater level of work and a lower level of staff and funding to implement this and related programs.

## Clean Lakes Program

In 1998, U.S. EPA amended its guidance for administering Nonpoint Source Pollution Abatement Program (section 319) to make all section 314 Clean Lake Program Activities eligible under s. 319. This allows Wisconsin to once again fund Clean Lake Program activities that were suspended when funding for s. 314 was eliminated in 1995. Wisconsin has completed all program funded activities previously funded under the s. 314 Clean Lakes Program. WDNR amended its work plan under section 319 to make Clean Lake Program activities eligible and re-established the state's Lake Water Quality Assessment Program, including lake monitoring and reporting. Currently, section 319 funding is used to support Lake Program activities including:

Self-help Citizen Monitoring – All aspects of this program including administration, data management, reporting and equipment purchase.

Lake Partnership Activities – Providing technical and informational assistance to lake organizations and management units, processing and administering the lake grant program, managing lake data and support for statewide meetings, conferences and training sessions.

Lake Planning and Evaluation – Support to select regional projects including exotic species prevention and monitoring, developing aquatic plant and sensitive area surveys, and collecting and summarizing water quality data and management actions on specific lakes.

Lake Protection and Restoration – Select projects that will protect or improve lake water quality and lake ecosystems. In 2002, s. 319 funding was used to assist in the restoration of Devil's Lake, Sauk County. Installation and operation of a bottom water withdrawal system to "mine" accumulated phosphorus from lake sediments over a period of approximately 15 years will reduce lake nutrient concentrations, alleviating fall algae blooms, incidences of swimmer's itch, and the bioavailability of mercury.

## Lake Planning and Protection

WDNR's Lake Planning and Protection Grants have a major and diverse impact on the management of the state's lakes. These grants, which are 75% state cost-shared, are at the core of the partnership between state and local entities that are striving to protect and restore lakes and their ecosystems. Currently, \$2.6 million is allocated annually to support a balance of locally-initiated projects ranging from data collection and development of lake management plans to land acquisition, local ordinance development, and management plan implementation.

## Lakes Assessment

The 2002 water quality assessment of lakes listed over 792,301 lake acres as impaired for one or more designated uses due to the presence of a general fish consumption advisory for mercury for all Wisconsin surface waters. Specifically, 767,533 lake acres were assessed for aquatic life uses and 361,598 acres were found to be fully meeting this designated use, while 270,055 lake acres are not meeting this use.

## Data Sources

Assessment of lakes for the 305(b) report is an integral component of Wisconsin's overall Watershed Program. Data used in assessments are derived from multiple sources, including the self-help monitoring program, baseline monitoring, long-term trend monitoring, and special studies.

## Trophic Status of Wisconsin Lakes

Summarizing the trophic status for all lakes for which data were available is another way to characterize the condition of Wisconsin's lakes. Data collected on lakes by WDNR staff, the Self-Help Citizen Monitoring Program and through projects funded by lake grants from 1997 through 2001 was compiled by WDNR staff. A trophic state index (TSI) was estimated for 990 lakes based on secchi disk (clarity). This data represents 45 percent of Wisconsin's total inland lake surface acre-

age. It is a biased sample in that it represents only the lakes that have been actively sampled. Approximately half of the waters listed in the table below exhibit what is considered to be excellent to good water quality (oligotrophic and mesotrophic conditions).

Table 6. Trophic State of Lakes (1997 -2001)

Trophic Condition	No.Lakes	Lake Acres
Oligotrophic	512	164,164
Mesotrophic	139	47,968
Eutrophic	299	190,971
Hyper-eutrophic	40	55,442
Total Assessed	990	458,546

Table 7. Trends in Significant Public Lakes

	No.Lakes	Lake Acres
Assessed for Trends	708	453,459
Improving	78	36,613
Stable	258	293,324
Degrading	51	15,112
Trend Unknown	321	10,8410

## Self-help Citizen Lake Monitoring

Wisconsin's Lake Partnership nurtures public involvement. High quality monitoring data supports sound management. WDNR relies on the public to gather data. There were over 1,200 citizen volunteers participating in the program at the end of 2003. Interest in volunteer lake monitoring continues to grow, with over 115 new volunteers starting in 2002, and 134 new volunteers in 2003. Many more volunteers are becoming involved in monitoring aquatic invasive species.

Figure 26: Self-Help Database

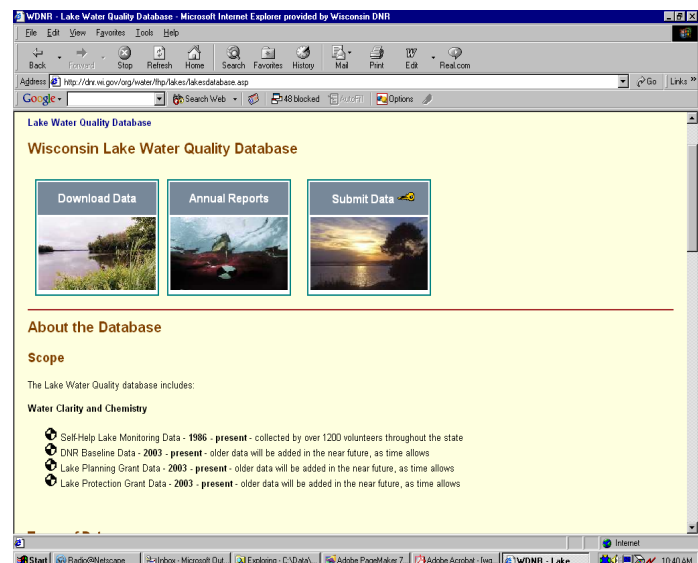


Table 8. Volunteer Monitors in Wisconsin, 2003

Parameter	# Volunteers (2003)
Secchi Disc Depth	1,210
Chlorophyll a and Total Phosphorus	394
Temperature and Dissolved Oxygen	221
Eurasian Watermilfoil	235
Purple Loosestrife	102
Aquatic Plants	72
Zebra Mussels	43
Curly Leaf Pondweed	6

The Volunteer Lake Monitoring program started in 1986, and by the mid-1990s the number of volunteers and interest exceeded WDNR's financial and data management capabilities. In 1999, this challenge was addressed through the expansion of the State Lake Planning Grant and significant improvements to the Self-Help Data Management System. Offering a small-scale, trend monitoring grants package in 5-year renewable increments, grant funding has facilitated growth in the chemistry-monitoring program. Approximately 30 additional lakes have been brought into the program each year under these grants.

The Self-Help Database is ever-improving, with better tracking of equipment, volunteer information, and more efficient data management. The database is searchable and contains over 17 years of data on many lakes. The website also features a data entry form, which allows volunteers to submit data through the Internet as an alternative to the existing touch-tone phone system or mail-in post cards. Changes in data management have enabled Annual Reports and awards to be completed on time. In 2003, over 900 annual reports were mailed to volunteers, along with hundreds to lake organizations. Also, over 267 awards were distributed in 2003 to volunteers who had completed 1, 5, 10 or 15 years of monitoring, or had taken 100 or 500 secchi readings. During the 2003 season, Self-Help awarded 7 fifteen-year awards.

Also significant is Self-Help volunteers' participation in a collaborative effort with UW Wisconsin Environmental Remote Sensing Center. Since 1999, volunteers have monitored their lakes on specific dates when satellites were overhead. Self-Help staff send the data to the UW Remote Sensing Center regularly to be used to calibrate computer programs that allow satellite imagery to be used to predict secchi disc depth and other water quality parameters on lakes.

## Satellite Imagery to Characterize Lake Water Quality

In 1999, WDNR formed a partnership with the UW Environmental Remote Sensing Center (ERSC). A primary goal of this collaboration is to investigate the use of satellite imagery in characterizing lake water quality. The UW ERSC personnel provide the expertise in accessing satellite images and processing spectral characteristics of satellite images, while the WDNR, through its various water quality monitoring programs, provides the actual ground-truthed measurements of various parameters contributing to lake water quality.

Since 1999, hundreds of Self-Help lake monitoring volunteers have coordinated their sampling efforts with the dates of Landsat (satellite) overpass. This effort successfully resulted in the development of a relationship between field measured lake water clarity and that predicted by analysis of the satellite images. Water clarity data for over 6,900 lakes was obtained from satellite imagery between 1999-2001. The next step, which will be pursued in 2004, will involve operationalizing the Landsat-based statewide monitoring system; this includes facilitation of the actual adoption and day-to-day use of the methods developed and demonstrated during this project by WDNR lake managers.

### Long-Term Trend Lakes Analysis (LTT)

The WDNR began a Long Term Trends Program in 1986, collecting nutrient, chemical, watershed and plant data on 50 lakes statewide to provide information for assessing, comparing and anticipating changes in lake quality. This program continues today, with some modifications to the protocols used.

The WDNR Lakes Program classifies LTT lakes into six hydrologic and depth classes within each ecoregion in Wisconsin and compares them with a larger set of lakes to evaluate the proportionality of the numbers in the different classes.

Overall, trends lakes should be representative of their class in their region. Consistency within classes will be evaluated by comparing a number of variables such as secchi depth, chlorophyll and total phosphorus levels. Following these analyses, changes may be made to the composition of the LTT lakes.

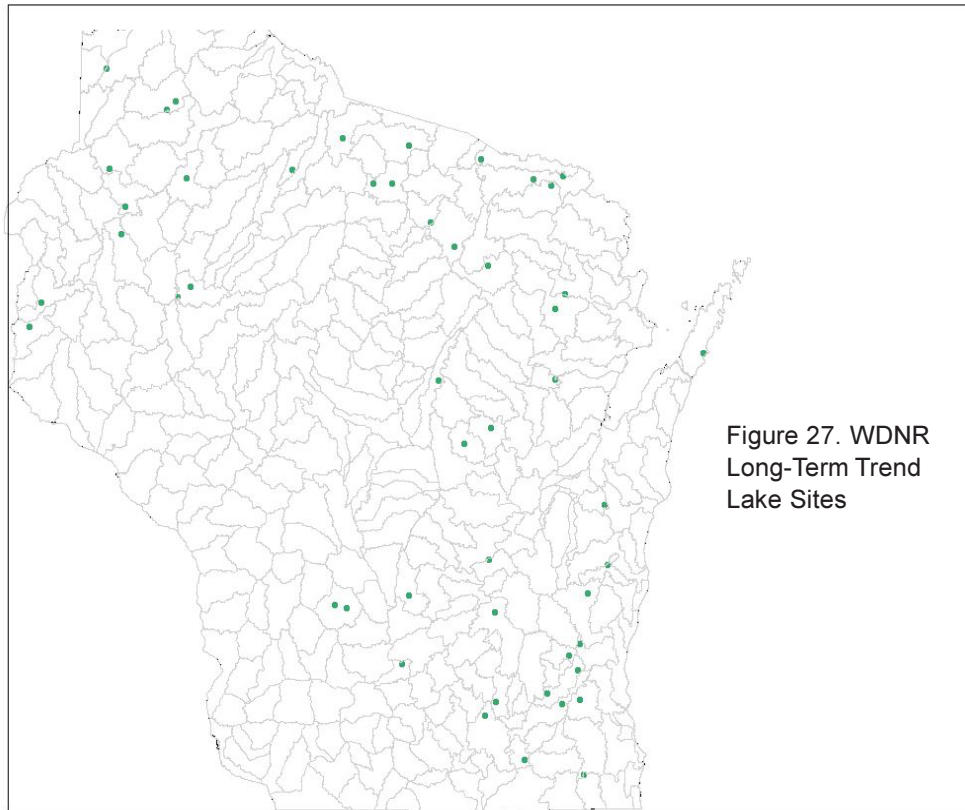


Figure 27. WDNR  
Long-Term Trend  
Lake Sites